May 1971

Brief 71-10111

NASA TECH BRIEF

Marshall Space Flight Center

Exhaust Cloud Rise and Diffusion in the Atmosphere

A new analytical approach was used to develop a physical-mathematical model of the rise, growth, and diffusion of exhaust clouds from rocket engines. Various aspects of the analytical derivations and the resultant model have direct application to the study of hot exhaust clouds or plumes from industrial stacks, making the results of this work applicable to the problem of air pollution.

A recent survey showed that there have been at least thirty different empirical and theoretical formulas available for calculating the rise of hot plumes from industrial stacks. Of these, the empirical formulas are not sufficiently general, and the theoretically derived formulas do not account for most of the important physical processes and atmospheric conditions. The new model simulates most of the significant physical processes involved in the rise and growth of exhaust clouds, and has a sound theoretical basis. Although the simulated processes and the differential equations describing them are somewhat complex, the solutions are mostly in algebraic form and easily obtainable. The new model formulations are general, and apply to all types of exhaust clouds and various atmospheric conditions.

Notes:

1. The following documentation may be obtained from:

   National Technical Information Service
   Springfield, Virginia 22151
   Single document price $3.00
   (or microfiche $0.95)

   Reference:
   NASA-CR-61331 (N70-35855), Rise and Growth of Space Vehicle Engine Exhaust and Associated Diffusion Models

2. Technical questions may be directed to:

   Technology Utilization Officer
   Code A&TS-TU
   Marshall Space Flight Center
   Huntsville, Alabama 35812
   Reference: B71-10111

Patent status:

No patent action is contemplated by NASA.

Source: S. D. Thayer, M. W. Chandler and R. T. Chu of GEOMET, Inc. under contract to Marshall Space Flight Center (MFS-21119)

Category 03